

REMARKS

This Amendment is responsive to the Office Action mailed on March 23, 2004. Claims 1-21 are cancelled without prejudice and new claims 22-32 are substituted therefor.

The drawings have been objected to as failing to show the all the features of the invention as claimed. The drawings have also been objected to as they include reference signs not mentioned in the specification. Applicant submits herewith replacement drawings for Figures 1A, 1B, 2A, 7A, 7C, 8B, and 8D, which are now labeled to show the features mentioned in the claims and to remove the reference signs which are not mentioned in the specification. No new matter has been added in the replacement Figures. Withdrawal of the objections to the drawings is respectfully requested.

Claims 1-21 are rejected as being indefinite. The claims are amended herein to overcome the indefiniteness rejection. Withdrawal of this rejection is respectfully requested.

Claims 1-21 are rejected under 35 U.S.C. § 102(b) as being anticipated by Ishikawa (US 5,696,389).

Applicants respectfully traverse these rejections in view of the amended claims and the following comments.

Discussion of Amended Claims

Claims 1-21 are cancelled and new claims 22-32 are substituted therefor. Support for new claims 22-26 can be found, for example, in Figures 1A and 8A and the corresponding descriptions in the specification. Support for new claims 27-32 can be found, for example, in Figures 1B, 2A, 7A, 7C, 8B, and 8D and the corresponding descriptions in the specification.

No new matter has been added by the addition of the new claims.

The new claims define an opto-electronic device in which the photon-active semiconductor layers in a vertical stack cooperate with lateral contact means provided separately for: (i) extracting electrons from the active layers or injecting electrons into the active layers, and (ii) for extraction or injection of holes. A lateral contact can be provided for cooperation with a

single active layer (e.g., as set forth in new claim 22) or with for a group of active layers (e.g., as set forth in new claim 27). The materials of the lateral contacts may be selected according to the energy levels of the active semiconductor layer(s) they are associated with. It should be noted that the lateral contacts here are not simple ohmic contacts as is usual in conventional opto-electronic devices.

The claimed device may use silicon-compatible materials. This means that not only SiGe and SiGeC materials may be used, but also various insulator compounds can be used as alternatives to SiO₂ for the gate insulator of MOSFETs, as well as various materials that can be grown epitaxially (pseudomorphic growth) on silicon and can have silicon grown epitaxially on them (also pseudomorphic growth).

The engineering of the materials and dimensions of the active layers, along with the engineering of the lateral contacts, enables a single device concept to be tailored to operate with different physical mechanisms, thereby resulting in different functionalities to suit a wide range of needs and applications.

The claimed device architecture allows implementing high-performance photo-electric and opto-electronic devices to be implemented independently of the choice of any materials system.

Discussion of Ishikawa

Claims 1-21 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Ishikawa. This rejection is respectfully traversed. An anticipation rejection requires that each and every element of the claimed invention as set forth in the claim be provided in the cited reference. See *Akamai Technologies Inc. v. Cable & Wireless Internet Services Inc.*, 68 USPQ2d 1186 (CA FC 2003), and cases cited therein. As discussed in detail below, Ishikawa does not meet the requirements for an anticipation rejection.

Ishikawa relates to certain aspects of the fabrication of Light-Emitting Diodes. In particular, Ishikawa discloses the vertical stacking of some layers, including the light-emitting layers, and the geometrical arrangement of electrical contacts to those layers. The electrical

contacts are simple ohmic contacts each provided on a top portion of a barrier layer of the device. For example, Figure 23 of Ishikawa relied on by the Examiner shows a substrate 301 having a number of active layers 304, 308, 313 and a number of barrier layers 303, 305, 307, 309, 312, and 314 vertically stacked on the substrate 301. Contacts (electrodes) 315, 316, 318 and 320 are arranged on the top exposed portion of the barrier layers.

In contrast to the arrangement of the contacts in Ishikawa, Applicant's claimed invention provides contact means which are formed on a first edge part of an insulator layer which is coextensive with the top surface of the crystalline structure. The contact means claimed by Applicant extend parallel with the direction of epitaxial deposition and are in contact with a side wall of at least one active semiconductor layer, as set forth in claim 22, or in contact with a side wall of a group of active semiconductor layers, as set forth in claim 27. In contrast, the contacts of Ishikawa are provided on the top exposed portion of the barrier layers, rather than in contact with the side walls of the active layers as claimed by Applicant. Further, the contacts disclosed in Ishikawa extend perpendicular to the direction of epitaxial deposition, rather than extend parallel to the direction of epitaxial deposition as claimed by Applicant.

Ishikawa does not disclose or remotely suggest an opto-electronic device having the contact structure claimed by Applicant. In particular, Ishikawa does not disclose or remotely suggest the contact means arrangement and structure set forth in Applicant's claim 22, wherein:

- first contact means are formed on a first edge part of the top surface of the insulator layer which is coextensive with a top surface of the crystalline substrate;
 - the first contact means extend parallel with a direction of epitaxial deposition;
 - the first contact means are in contact with one side wall of at least one active semiconductor layer for extracting electrons from or injecting electrons into the active semiconductor layer(s) associated therewith;
 - second contact means are formed on a second edge part of the top surface of the insulator layer;
 - the second contact means extend parallel with the direction of epitaxial deposition;
- and

- the second contact means are in contact with a second side wall of at least one active semiconductor layer for extracting holes from or injecting holes into the active semiconductor layer(s) associated therewith.

Further, Ishikawa does not disclose or remotely suggest the contact means arrangement or structure set forth in Applicant's claim 27, wherein contact means similar in structure to those defined in claim 22 are provided for different groups of alternating photon-active semiconductor and insulator layers.

In addition, Ishikawa does not disclose new materials for use in light emission devices, nor does it disclose a new device physics or operation mode as claimed. The materials used in Ishikawa for the active areas to emit light are II-VI compounds and/or III-V compounds. None of these materials disclosed in Ishikawa are conventionally considered to be a silicon-compatible alloy compound as set forth in claims 23 and 28.

As Ishikawa does not disclose each and every element of the invention as claimed, the rejections under 35 U.S.C. § 102(b) are believed to be improper, and withdrawal of the rejections is respectfully requested. See, *Akamai Technologies Inc., supra*.

Applicant respectfully submits that the present invention is not anticipated by and would not have been obvious to one skilled in the art in view of Ishikawa, taken alone or in combination with any of the other prior art of record.

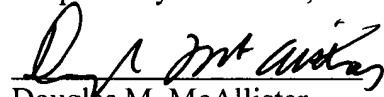
Further remarks regarding the asserted relationship between Applicant's claims and the prior art are not deemed necessary, in view of the amended claims and the foregoing discussion. Applicants' silence as to any of the Examiner's comments is not indicative of an acquiescence to the stated grounds of rejection.

Withdrawal of the rejections under 35 U.S.C. § 102(b) is therefore respectfully requested.

Conclusion

The Examiner is respectfully requested to reconsider this application, allow each of the pending claims and to pass this application on to an early issue. If there are any remaining issues that need to be addressed in order to place this application into condition for allowance, the Examiner is requested to telephone Applicants' undersigned attorney.

Respectfully submitted,



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Date: June 22, 2003